

What is claimed is:

1. An automated data storage library, comprising:

a plurality of storage shelves for storing portable data storage media;

at least one data storage drive for transferring data with respect to said portable data

5 storage media;

a plurality of accessors which separately access and transport portable data storage media with respect to said plurality of storage shelves and said at least one data storage drive, along at least one path, and which interfere with one another along said at least one path; and

a library controller for operating said plurality of accessors, said library controller, in

10 response to detection of restricted movement of one of said plurality of accessors at a position along said at least one path, determines a range of motion of another of said plurality of accessors along said at least one path which avoids interfering with said accessor having said restricted movement, at said position along said at least one path.

2. The automated data storage library of Claim 1, additionally comprising a plurality of

15 frames in sequence along said at least one path, said frames supporting said plurality of storage shelves and said at least one data storage drive; and wherein said library controller additionally determines the one of said frames in which said accessor having said restricted movement is positioned, to detect said position along said at least one path of said accessor having said restricted movement.

3. The automated data storage library of Claim 2, wherein said library controller determines said range of motion comprising limiting motion of said another accessor to said frames of said sequence, extending from a frame of said sequence spaced from said one of said frames in which said accessor having said restricted movement is positioned, to one end of said automated data
5 storage library, all in the direction of said at least one path toward said another accessor.

4. The automated data storage library of Claim 1, wherein said storage shelves are arranged in a plurality of columns along said at least one path; and wherein said library controller additionally determines the one of said columns at which said accessor having said restricted movement is substantially positioned, to detect said position along said at least one path of said
10 accessor having said restricted movement.

5. The automated data storage library of Claim 4, wherein said library controller determines said range of motion comprising limiting motion of said another accessor along said at least one path, extending from a column spaced from said column at which said accessor having said restricted movement is positioned, to one end of said automated data storage library, all in the
15 direction of said at least one path toward said another accessor.

6. The automated data storage library of Claim 1, wherein said library controller additionally operates said another of said plurality of accessors to attempt to move said failed accessor to detect said restricted movement of one of said plurality of accessors, detecting said restricted movement by failure to move said failed accessor, and detecting the position of said another
5 accessor along said at least one path at said failure.

7. The automated data storage library of Claim 1, wherein said library controller reads said position of said accessor having said restricted movement, from said failed accessor.

8. The automated data storage library of Claim 7, wherein said library controller additionally operates said another of said plurality of accessors to attempt to move said failed accessor to
10 detect said restricted movement of one of said plurality of accessors, and detects said restricted movement by failure to move said failed accessor.

9. The automated data storage library of Claim 7, wherein said failed accessor having said restricted movement, provides a movement failure indication, and said library controller detects said restricted movement of one of said plurality of accessors, from a received movement failure
15 indication from said failed accessor.

10. An automated data storage library, comprising:

a plurality of storage shelves for storing portable data storage media;

at least one data storage drive for transferring data with respect to said portable data storage media;

5 a plurality of accessors which separately access and transport portable data storage media with respect to said plurality of storage shelves and said at least one data storage drive, along at least one path, and which interfere with one another along said at least one path;

a work queue of commands for operating at least one of said plurality of accessors; and

a library controller for operating said plurality of accessors, said library controller:

10 detects restricted movement of one of said plurality of accessors at a position along said at least one path;

determines a limit to commands of said work queue, said limit from and past said position of said accessor having said restricted movement, along said at least one path; and

15 prevents execution of said limited commands.

11. The automated data storage library of Claim 10, wherein said library controller fails said limited commands with a “hardware” error to prevent execution of said limited commands.

12. The automated data storage library of Claim 10, wherein said commands for operating said at least one of said plurality of accessors comprise at least an origin and a destination, and wherein said library controller determines whether either an origin or a destination of a command of said work queue is beyond said limit, to determine said limit to commands of said work queue.
- 5 13. The automated data storage library of Claim 12, wherein said automated data storage library comprises a plurality of frames in sequence along said at least one path; and wherein said library controller additionally determines the one of said frames in which said accessor having said restricted movement is positioned, to detect said position along said at least one path of said accessor having said restricted movement.
- 10 14. The automated data storage library of Claim 13, wherein said library controller establishes said limit to commands of said work queue at a frame of said sequence spaced from said one of said frames in which said accessor having said restricted movement is positioned, said frame spaced in the direction of said at least one path toward said another accessor, to determine said limit to commands of said work queue.
- 15 15. The automated data storage library of Claim 12, wherein said storage shelves are arranged in a plurality of columns along said at least one path; and wherein said library controller additionally determines the one of said columns at which said accessor having said restricted movement is substantially positioned, to detect said position along said at least one path of said accessor having said restricted movement.

16. The automated data storage library of Claim 15, wherein said library controller establishes said limit to commands of said work queue at a column spaced from said column at which said accessor having said restricted movement is positioned, said column of said limit spaced in the direction of said at least one path toward said another accessor, to determine said
5 limit to commands of said work queue.

17. A controller for operating a plurality of accessors of an automated data storage library which separately access said automated data storage library along at least one path, and which interfere with one another along said at least one path, said controller:

detects restricted movement of one of said plurality of accessors at a position along said
5 at least one path; and

determines a range of motion of another of said plurality of accessors along said at least one path which avoids interfering with said accessor having said restricted movement, at said position along said at least one path.

18. The controller of Claim 17, wherein said automated data storage library comprises a
10 plurality of frames in sequence along said at least one path; and wherein said controller additionally determines the one of said frames in which said accessor having said restricted movement is positioned, to detect said position along said at least one path of said accessor having said restricted movement.

19. The controller of Claim 18, wherein said controller determines said range of motion
15 comprising limiting motion of said another accessor to said frames of said sequence, extending from a frame of said sequence spaced from said one of said frames in which said accessor having said restricted movement is positioned, to one end of said automated data storage library, all in the direction of said at least one path toward said another accessor.

20. The controller of Claim 17, wherein said automated data storage library comprises a plurality of storage shelves for storing portable data storage media for access by said plurality of accessors, said storage shelves arranged in a plurality of columns along said at least one path; and wherein said controller additionally determines the one of said columns at which said accessor
5 having said restricted movement is substantially positioned, to detect said position along said at least one path of said accessor having said restricted movement.

21. The controller of Claim 20, wherein said controller determines said range of motion comprising limiting motion of said another accessor along said at least one path, extending from a column spaced from said column at which said accessor having said restricted movement is
10 positioned, to one end of said automated data storage library, all in the direction of said at least one path toward said another accessor.

22. The controller of Claim 17, wherein said controller additionally operates said another of said plurality of accessors to attempt to move said failed accessor to detect said restricted movement of one of said plurality of accessors, detecting said restricted movement by failure to
15 move said failed accessor, and detecting the position of said another accessor along said at least one path at said failure.

23. The controller of Claim 17, wherein said controller reads said position of said accessor having said restricted movement, from said failed accessor.

24. The controller of Claim 23, wherein said controller additionally operates said another of said plurality of accessors to attempt to move said failed accessor to detect said restricted
5 movement of one of said plurality of accessors, and detects said restricted movement by failure to move said failed accessor.

25. The controller of Claim 23, wherein said failed accessor having said restricted movement, provides a movement failure indication, and said controller detects said restricted movement of one of said plurality of accessors, from a received movement failure indication from said failed
10 accessor.

26. A controller for operating a plurality of accessors of an automated data storage library which separately access said automated data storage library along at least one path, and which interfere with one another along said at least one path, said automated data storage library having a work queue of commands for operating at least one of said plurality of accessors, said

5 controller:

detects restricted movement of one of said plurality of accessors at a position along said at least one path;

determines a limit to commands of said work queue, said limit from and past said position of said accessor having said restricted movement, along said at least one path; and

10 prevents execution of said limited commands.

27. The controller of Claim 26, wherein said controller fails said limited commands with a “hardware” error to prevent execution of said limited commands.

28. The controller of Claim 26, wherein said commands for operating said at least one of said plurality of accessors comprise at least an origin and a destination, and said controller determines
15 whether either an origin or a destination of a command of said work queue is beyond said limit, to determine said limit to commands of said work queue.

29. The controller of Claim 28, wherein said automated data storage library comprises a plurality of frames in sequence along said at least one path; and wherein said controller additionally determines the one of said frames in which said accessor having said restricted movement is positioned, to detect said position along said at least one path of said accessor
5 having said restricted movement.

30. The controller of Claim 29, wherein said controller establishes said limit to commands of said work queue at a frame of said sequence spaced from said one of said frames in which said accessor having said restricted movement is positioned, said frame spaced in the direction of said at least one path toward said another accessor, to determine said limit to commands of said work
10 queue.

31. The controller of Claim 28, wherein said automated data storage library comprises a plurality of storage shelves for storing portable data storage media for access by said plurality of accessors, said storage shelves arranged in a plurality of columns along said at least one path; and wherein said controller additionally determines the one of said columns at which said accessor
15 having said restricted movement is substantially positioned, to detect said position along said at least one path of said accessor having said restricted movement.

32. The controller of Claim 31, wherein said controller establishes said limit to commands of said work queue at a column spaced from said column at which said accessor having said restricted movement is positioned, said column of said limit spaced in the direction of said at least one path toward said another accessor, to determine said limit to commands of said work
5 queue.

33. A method for operating a plurality of accessors of an automated data storage library which separately access said automated data storage library along at least one path, and which interfere with one another along said at least one path, said method comprising the steps of:

detecting restricted movement of one of said plurality of accessors at a position along said

5 at least one path; and

determining a range of motion of another of said plurality of accessors along said at least one path which avoids interfering with said accessor having said restricted movement, at said position along said at least one path.

34. The method of Claim 33, wherein said automated data storage library comprises a

10 plurality of frames in sequence along said at least one path; and wherein said step of detecting said restricted movement of one of said plurality of accessors at a position along said at least one path, additionally comprises determining the one of said frames in which said accessor having said restricted movement is positioned.

35. The method of Claim 34, wherein said step of determining said range of motion

15 comprises limiting motion of said another accessor to said frames of said sequence, extending from a frame of said sequence spaced from said one of said frames in which said accessor having said restricted movement is positioned, to one end of said automated data storage library, all in the direction of said at least one path toward said another accessor.

36. The method of Claim 33, wherein said automated data storage library comprises a plurality of storage shelves for storing portable data storage media for access by said plurality of accessors, said storage shelves arranged in a plurality of columns along said at least one path; and wherein said step of detecting said restricted movement of one of said plurality of accessors at a position along said at least one path, additionally comprises determining the one of said columns at which said accessor having said restricted movement is substantially positioned.

37. The method of Claim 36, wherein said step of determining said range of motion comprises limiting motion of said another accessor along said at least one path, extending from a column spaced from said column at which said accessor having said restricted movement is positioned, to one end of said automated data storage library, all in the direction of said at least one path toward said another accessor.

38. The method of Claim 33, wherein said step of detecting said restricted movement of one of said plurality of accessors at a position along said at least one path, comprises operating said another of said plurality of accessors to attempt to move said failed accessor, detecting said restricted movement by failure to move said failed accessor, and detecting the position of said another accessor along said at least one path at said failure.

39. The method of Claim 33, wherein said step of detecting said restricted movement of one of said plurality of accessors at a position along said at least one path, additionally comprises reading said position from said failed accessor.

40. The method of Claim 39, wherein said step of detecting said restricted movement of one of said plurality of accessors comprises operating said another of said plurality of accessors to attempt to move said failed accessor, and detecting said restricted movement by failure to move said failed accessor.

5 41. The method of Claim 39, wherein said step of detecting said restricted movement of one of said plurality of accessors comprises receiving a movement failure indication from said failed accessor

42. A method for operating a plurality of accessors of an automated data storage library which separately access said automated data storage library along at least one path, and which interfere with one another along said at least one path, said automated data storage library having a work queue of commands for operating at least one of said plurality of accessors, said method

5 comprising the steps of:

detecting restricted movement of one of said plurality of accessors at a position along said at least one path;

determining a limit to commands of said work queue, said limit from and past said position of said accessor having said restricted movement, along said at least one path; and

10 preventing execution of said limited commands.

43. The method of Claim 42, wherein said step of preventing execution of said limited commands additionally comprises failing said limited commands with a “hardware” error.

44. The method of Claim 42, wherein said commands for operating said at least one of said plurality of accessors comprise at least an origin and a destination, and said step of determining a

15 limit to commands of said work queue comprises determining whether either an origin or a destination of a command of said work queue is beyond said limit.

45. The method of Claim 44, wherein said automated data storage library comprises a plurality of frames in sequence along said at least one path; and wherein said step of detecting said restricted movement of one of said plurality of accessors at a position along said at least one path, additionally comprises determining the one of said frames in which said accessor having
5 said restricted movement is positioned.

46. The method of Claim 45, wherein said step of determining a limit to commands of said work queue comprises establishing said limit at a frame of said sequence spaced from said one of said frames in which said accessor having said restricted movement is positioned, said frame spaced in the direction of said at least one path toward said another accessor.

10 47. The method of Claim 44, wherein said automated data storage library comprises a plurality of storage shelves for storing portable data storage media for access by said plurality of accessors, said storage shelves arranged in a plurality of columns along said at least one path; and wherein said step of detecting said restricted movement of one of said plurality of accessors at a position along said at least one path, additionally comprises determining the one of said columns
15 at which said accessor having said restricted movement is substantially positioned.

48. The method of Claim 47, wherein said step of determining a limit to commands of said work queue comprises establishing said limit at a column spaced from said column at which said accessor having said restricted movement is positioned, said column of said limit spaced in the direction of said at least one path toward said another accessor.

49. A computer program product usable with at least one programmable computer processor having computer readable code embodied therein, said at least one programmable computer processor for operating a plurality of accessors of an automated data storage library which separately access said automated data storage library along at least one path, and which interfere
5 with one another along said at least one path, said computer program product comprising:
computer readable program code causing said at least one programmable computer processor to detect restricted movement of one of said plurality of accessors at a position along said at least one path; and
computer readable program code causing said at least one programmable computer
10 processor to determine a range of motion of another of said plurality of accessors along said at least one path which avoids interfering with said accessor having said restricted movement, at said position along said at least one path.

50. The computer program product of Claim 49, wherein said automated data storage library comprises a plurality of frames in sequence along said at least one path; and additionally
15 comprising computer readable program code causing said at least one programmable computer processor to determine the one of said frames in which said accessor having said restricted movement is positioned, to detect said position along said at least one path of said accessor having said restricted movement.

51. The computer program product of Claim 50, wherein said computer readable program code causing said at least one programmable computer processor to determine said range of motion comprises limiting motion of said another accessor to said frames of said sequence, extending from a frame of said sequence spaced from said one of said frames in which said
5 accessor having said restricted movement is positioned, to one end of said automated data storage library, all in the direction of said at least one path toward said another accessor.

52. The computer program product of Claim 49, wherein said automated data storage library comprises a plurality of storage shelves for storing portable data storage media for access by said plurality of accessors, said storage shelves arranged in a plurality of columns along said at least
10 one path; and wherein said computer readable program code causing said at least one programmable computer processor to detect said restricted movement of one of said plurality of accessors at a position along said at least one path, additionally comprises determining the one of said columns at which said accessor having said restricted movement is substantially positioned.

53. The computer program product of Claim 52, wherein said computer readable program
15 code causing said at least one programmable computer processor to determine said range of motion comprises limiting motion of said another accessor to said frames of said sequence, extending from a column spaced from said column at which said accessor having said restricted movement is positioned, to one end of said automated data storage library, all in the direction of said at least one path toward said another accessor.

54. The computer program product of Claim 49, wherein said computer readable program code causing said at least one programmable computer processor to detect said restricted movement of one of said plurality of accessors at a position along said at least one path, comprises computer readable program code causing said at least one programmable computer processor to operate said another of said plurality of accessors to attempt to move said failed accessor, detecting said restricted movement by failure to move said failed accessor, and detecting the position of said another accessor along said at least one path at said failure.

55. The computer program product of Claim 49, wherein said computer readable program code causing said at least one programmable computer processor to detect said restricted movement of one of said plurality of accessors at a position along said at least one path, additionally comprises computer readable program code causing said at least one programmable computer processor to read said position from said failed accessor.

56. The computer program product of Claim 55, wherein said computer readable program code causing said at least one programmable computer processor to detect said restricted movement of one of said plurality of accessors at a position along said at least one path, comprises computer readable program code causing said at least one programmable computer processor to operate said another of said plurality of accessors to attempt to move said failed accessor, detecting said restricted movement by failure to move said failed accessor.

57. The computer program product of Claim 55, wherein said computer readable program code causing said at least one programmable computer processor to detect said restricted movement of one of said plurality of accessors at a position along said at least one path, comprises computer readable program code causing said at least one programmable computer
5 processor to receive a movement failure indication from said failed accessor.

58. A computer program product usable with at least one programmable computer processor having computer readable code embodied therein, said at least one programmable computer processor for operating a plurality of accessors of an automated data storage library which separately access said automated data storage library along at least one path, and which interfere
5 with one another along said at least one path, said automated data storage library having a work queue of commands for operating at least one of said plurality of accessors, said computer program product comprising:

computer readable program code causing said at least one programmable computer processor to detect restricted movement of one of said plurality of accessors at a position along

10 said at least one path;

computer readable program code causing said at least one programmable computer processor to determine a limit to commands of said work queue, said limit from and past said position of said accessor having said restricted movement, along said at least one path; and

computer readable program code causing said at least one programmable computer

15 processor to prevent execution of said limited commands.

59. The computer program product of Claim 58, wherein said computer readable program code causing said at least one programmable computer processor to prevent execution of said limited commands, additionally comprises computer readable program code causing said at least one programmable computer processor to fail said limited commands with a “hardware” error.

20 60. The computer program product of Claim 58, wherein said commands for operating said at least one of said plurality of accessors comprise at least an origin and a destination, and wherein

said computer readable program code causing said at least one programmable computer processor to determine a limit to commands of said work queue, comprises computer readable program code causing said at least one programmable computer processor to determine whether either an origin or a destination of a command of said work queue is beyond said limit.

5 **61.** The computer program product of Claim **60**, wherein said automated data storage library comprises a plurality of frames in sequence along said at least one path; and additionally comprising computer readable program code causing said at least one programmable computer processor to determine the one of said frames in which said accessor having said restricted movement is positioned, to detect said position along said at least one path of said accessor
10 having said restricted movement.

62. The computer program product of Claim **61**, wherein said computer readable program code causing said at least one programmable computer processor to determine a limit to commands of said work queue comprises establishing said limit at a frame of said sequence spaced from said one of said frames in which said accessor having said restricted movement is
15 positioned, said frame spaced in the direction of said at least one path toward said another accessor.

63. The computer program product of Claim 60, wherein said automated data storage library comprises a plurality of storage shelves for storing portable data storage media for access by said plurality of accessors, said storage shelves arranged in a plurality of columns along said at least one path; and wherein said computer readable program code causing said at least one

5 programmable computer processor to detect said restricted movement of one of said plurality of accessors at a position along said at least one path, additionally comprises determining the one of said columns at which said accessor having said restricted movement is substantially positioned, to detect said position along said at least one path of said accessor having said restricted movement.

10 64. The computer program product of Claim 63, wherein said computer readable program code causing said at least one programmable computer processor to determine a limit to commands of said work queue comprises establishing said limit at a column spaced from said column at which said accessor having said restricted movement is positioned, said column of said limit spaced in the direction of said at least one path toward said another accessor.